

## AVERAGE MATCHING RATE ALGORITHM FOR FINGERPRINT VERIFICATION

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### ABSTRACT

In this paper, a fingerprint verification algorithm with template matching has been presented. A average matching rate has been used for a correlation value between a template and a sensed image. The correlation based method first selects appropriate templates in primary fingerprint and then locates it into the secondary fingerprint and then compares the template position of both fingerprints but in the average matching rate we utilize the cyclic structure observed in the local area of a fingerprint pattern, which is calculated by the maximum matching rate plus minimum matching rate whole divided by 2 detected near the point where the matching rate is maximum. We have splitted the template image to gain the maximum results for the cyclic structure against the sensed image

**KEYWORDS:** Average, Correlation, Cyclic, Fingerprint, Ridge, Valley

### INTRODUCTION

A fingerprint consists of ridge valley structures as shown in figure 1. The ridge valley Structures provides the main source of information to be extracted from the fingerprints. There are two details present in the fingerprint

First is the directional field which is the local orientation of the ridge valley structures at each position in the fingerprint, it gives the coarse structure and the basic shape of the fingerprint

Second is the minutiae, that provides details about ridge valley structures, it includes ridge matching and bifurcations and it is used for one – to – one comparison of two fingerprints

In a fingerprint identification system , a person offer his finger and then the system searches for his print in the internal database for a matching print, if a matching print is found the person is identified.



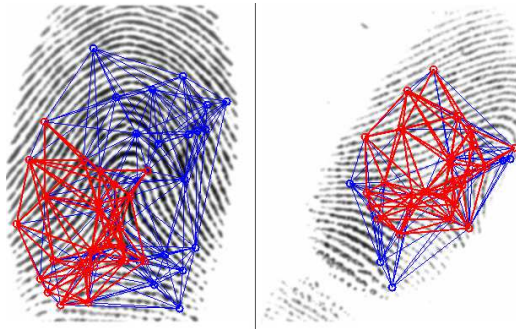
**Figure 1: Example of a Fingerprint, the Ridges are Black and Valleys are White in this Figure**

### MINUTIAE – BASED APPROACH

It is basically used for good quality Images, it is widely used for commercial applications as it has less computation time and has high performance. It tries to align the minutiae of the primary image with suitable minutiae of

the secondary image and then find the resemblance between them. The aligning of the fingerprint should be in order so that maximum minutiae can match which is very important

The main drawback with minutiae based approach is that it can only be used for the good quality images because from the bad quality images it is not able extract write minutiae , the collected minutiae are false which can result to false fingerprint matching



**Figure 2: Minutiae of Two Finger Prints are Matched**

### **CORRELATION BASED FINGERPRINT MATCHING**

In the correlation based finger printing technique richer gray-scale information of the fingerprints as compared to the traditional minutiae-based systems. This method locates the appropriate templates in the initial fingerprint and then locate the templates in the secondary fingerprint by using template matching technique and compares the template positions of both fingerprints. This method can also be used for dealing with bad quality from which no minutiae can be extracted. For matching two fingerprints by using correlation matching technique , the fingerprints has to be aligned so as the correlation for each corresponding pixel comes true, but the rotation and displacement factors are unknown, it is necessary to apply the correlation to all possible alignments.

The main drawback of the correlation based fingerprint matching is its computational complexity and less tolerance to non linear distortion and contrast variation

So as to overcome this problem the average matching rate can be used as a new correlation value, There are different patterns of ridge and valleys present in different fingerprints. As the ridge and valleys repeat themselves after a fixed width they form a unique cyclic structure. So by looking at the ridges and also the cyclic pattern the fingerprint can easily be verified.



**(a) Primary Fingerprint (b) Matching Fingerprint (c) Non-Matching Fingerprint**

**Figure 3: Matching Points between Three Fingerprints**

## TEMPLATE MATCHING

When from the initial fingerprints the templates are selected, they have to be located in the secondary fingerprints, which is done by using normal template matching techniques. The template is shifted throughout the secondary fingerprint pixel wise where at each position gray level distance between each position and the corresponding area in the secondary print is determined by summing the squared gray level difference and then the position where the distance was found to be minimal is chosen as the corresponding position of the template in the second fingerprint.

## SPLITTED TEMPLATE MATCHING

When the template image is scanned against the primary image as a whole the matching rate is different in many regions of the template image if the cyclic structure is present in the direction of scanned image then the matching rate differs with the cycle of fingerprint pattern of the primary image and if the cyclic structure is not present in the scan direction the matching rate doesn't change with cyclicity. So the matching rate is formed by merging all regions, which is basically different from the original. So as to overcome this problem we have proposed a splitted template matching in which we split the template into many templates and then match each template with the scanned image so as to get the same cyclic structure and from each template we get the maximum and minimum matching points and finally we total up all the results.

## DISCUSSIONS

We are proposing that if the average matching rate is taken as the correlation value and the splitted template matching technique came into place then the difference between the correlation value of the fingerprints of the same finger's are widened. The average matching rate looks into the cyclic structure of a fingerprint pattern. Splitted template matching keeps the cyclicity and is also available for the defomative fingerprints. In a verification experiment, the proposed method separated the correlation value of the same finger's fingerprints and different fingers' fingerprints more widely and more clearly than the conventional method. In conclusion, by using this algorithm we can easily achieve threshold value of the matching rate and accuracy for practical puposes

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